

RF TEST REPORT

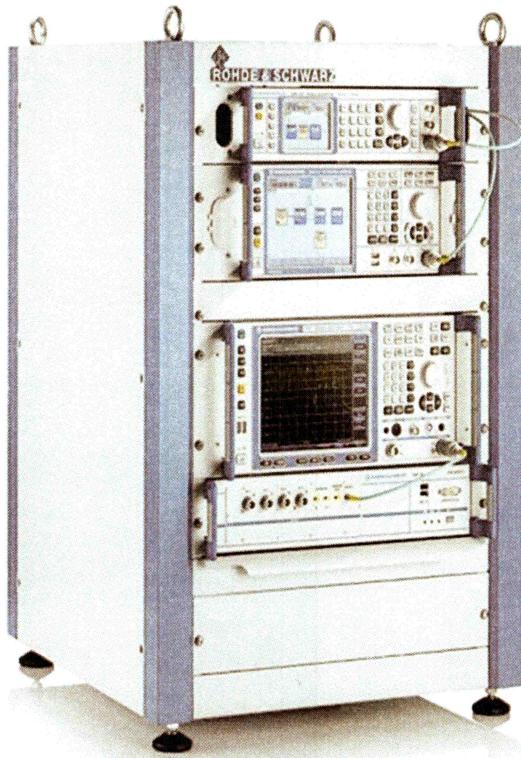
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Motion Sensor

ISSUED TO
Konec Home Pty Ltd

Suite 5.02 level 5 15 Talavera Road Macquarie Park NSW 2113
Australia



Tested by: Ye Hongji

Ye Hongji

Date

Apr. 12. 2021

Approved by: Wei Yanquan

Wei Yanquan
(Chief Engineer)

Date

Aug. 12. 2021

Report No.: BL-SZ2140982-601

EUT Name: Motion Sensor

Model Name: RTCGQ11LM

Brand Name: Aqara

Test Standard: AS/NZS 4268:2017

Test Conclusion:

Test Date:

Date of Issue:

Pass

Apr. 28, 2021 ~ May 11, 2021

Aug. 12, 2021

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Revision History

| Version | Issue Date | Revisions Content |
|----------------|----------------------|----------------------|
| <u>Rev. 01</u> | <u>Aug. 12, 2021</u> | <u>Initial Issue</u> |

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

| | |
|--------------|---|
| Company Name | Shenzhen BALUN Technology Co., Ltd. |
| Address | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100 |

1.2 Identification of the Responsible Testing Location

| | |
|---------------|---|
| Test Location | Shenzhen BALUN Technology Co., Ltd. |
| Address | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Description | All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055 |

1.3 Laboratory Condition

| | |
|---------------------------|--------------------|
| Ambient Temperature | 20°C to 25°C |
| Ambient Relative Humidity | 45% to 55% |
| Ambient Pressure | 100 kPa to 102 kPa |

1.4 Announce

- (1) The test report reference to the report template version v1.2.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 PRODUCT INFORMATION

2.1 Applicant Information

| | |
|-----------|---|
| Applicant | Konec Home Pty Ltd |
| Address | Suite 5.02 level 5 15 Talavera Road Macquarie Park NSW 2113 Australia |

2.2 Manufacturer Information

| | |
|--------------|--|
| Manufacturer | Lumi United Technology Co., Ltd |
| Address | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen, China |

2.3 Factory Information

| | |
|---------|-----|
| Factory | N/A |
| Address | N/A |

2.4 General Description for Equipment under Test (EUT)

| | |
|---|---------------|
| EUT Name | Motion Sensor |
| Under Test Model Name | RTCGQ11LM |
| Series Model Name | N/A |
| Description of Model name differentiation | N/A |
| Hardware Version | V1.0.1 |
| Software Version | V1.0.1 |
| Dimensions (Approx.) | N/A |
| Weight (Approx.) | N/A |

2.5 Technical Information

| | |
|-----------------------------------|-----------------------|
| EUT Type | Stand-alone equipment |
| Network and Wireless connectivity | Zigbee |

The requirement for the following technical information of the EUT was tested in this report:

| | |
|--------------------------|--|
| Frequency Range | The frequency range used is 2402 MHz – 2480 MHz; The frequency block is 2400 MHz to 2483.5 MHz. |
| Modulation Mode | O-QPSK |
| Antenna Type | Monopole Antenna |
| Antenna Gain | 2.0 dBi (In test items related to antenna gain, the final results reflect this figure.) |
| Beamforming Gain | N/A |
| Adaptive or non-adaptive | Non-Adaptive |
| LBT Based | Non-LBT Based |
| The Max RF Output power | 9.6 dBm |
| Receiver Category | 2 |

2.6 Additional Instructions

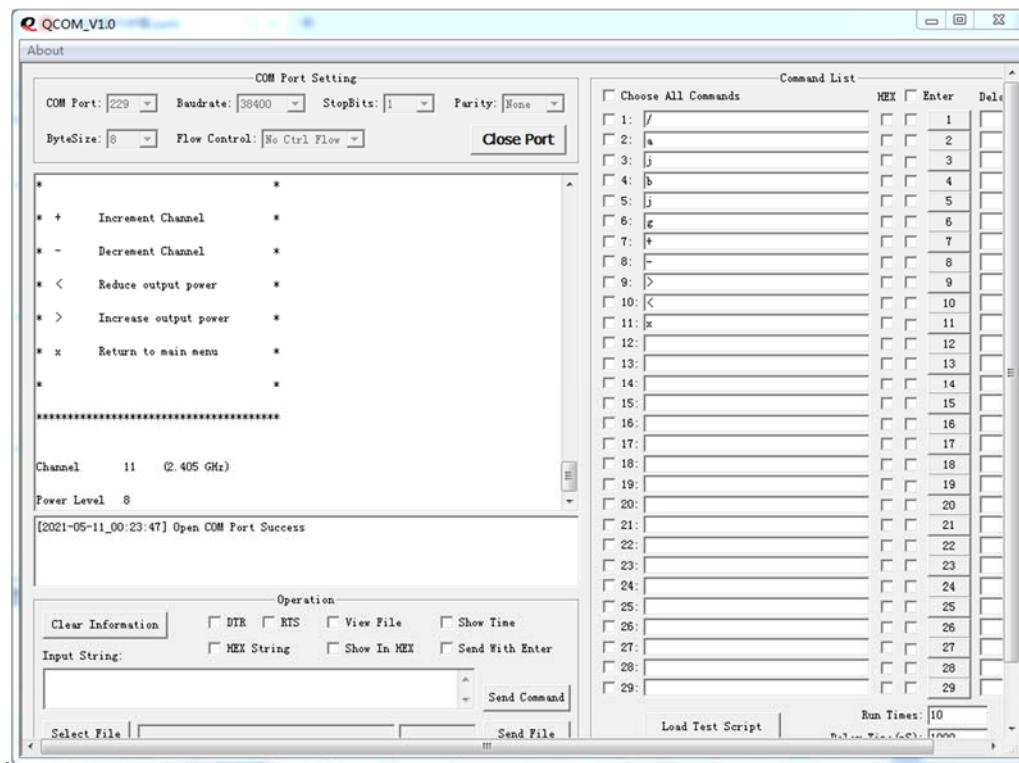
EUT Software Settings:

| | |
|------|--|
| Mode | <input checked="" type="checkbox"/> Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually. |
|------|--|

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

| Power level setup in software | | | | |
|--|-----------------|--------------|----------------------------------|--|
| Test Software Version | QCOM_V1.0 | | | |
| Support Units (Software installation media) | Description | Manufacturer | Model | |
| | Notebook | Lenovo | X220 | |
| Mode | Frequency (MHz) | | Soft Set | |
| O-QPSK | 2405 | | Power parameter Settings is 8 | |
| | 2440 | | | |
| | 2480 | | | |

Run Software:



3 SUMMARY OF TEST RESULTS

| No. | Identity | Document Title |
|-----|----------------------------------|--|
| 1 | AS/NZS 4268:2017 | Radio equipment and systems - Short range devices - Limits and methods of measurement |
| 2 | ETSI EN 300 328 V2.2.2 (2019-07) | Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum |

Test items and the results are as follows:

| Report Section | Standard Rule | Description | Channel | Test Result | Verdict | Remark |
|---|----------------------|--|-----------------|-------------|---------|---------------------------------------|
| Transmitter Parameters | | | | | | |
| 5.1.1 | 4.3.1.2 4.3.2.2 | RF output power | Low/Middle/High | ANNEX A.1 | Pass | -- |
| 5.1.2 | 4.3.2.3 | Power Spectral Density | Low/Middle/High | ANNEX A.2 | Pass | Note ⁴ |
| 5.1.3 | 4.3.1.3 4.3.2.4 | Duty Cycle, Tx-sequence, Tx-gap | N/A | ANNEX A.3 | N/A | Note ² , Note ⁷ |
| 5.1.4 | 4.3.1.4 | Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | -- | ANNEX A.4 | N/A | Note ⁵ |
| 5.1.5 | 4.3.1.5 | Hopping Frequency Separation | -- | ANNEX A.5 | N/A | Note ⁵ |
| 5.1.6 | 4.3.1.6 4.3.2.5 | Medium Utilisation (MU) factor | N/A | ANNEX A.6 | N/A | Note ² , Note ⁷ |
| 5.1.7 | 4.3.1.7 4.3.2.6 | Adaptivity | N/A | ANNEX A.7 | N/A | Note ² , Note ³ |
| 5.1.8 | 4.3.1.8 4.3.2.7 | Occupied Channel Bandwidth | Low/ High | ANNEX A.8 | Pass | -- |
| 5.1.9 | 4.3.1.9 4.3.2.8 | Transmitter unwanted emissions in the out-of-band domain | Low/High | ANNEX A.9 | Pass | -- |
| 5.1.10 | 4.3.1.10 4.3.2.7 | Transmitter unwanted emissions in the spurious domain | Low/High | ANNEX A.10 | Pass | -- |
| Receiver Parameters | | | | | | |
| 5.2.1 | 4.2.3.2 | Receiver categories | -- | -- | -- | -- |
| 5.2.2 | 4.3.1.11 4.3.2.10 | Receiver spurious emissions | Low/High | ANNEX A.11 | Pass | -- |
| 5.2.3 | 4.3.1.12 4.3.2.11 | Receiver Blocking | Low/High | ANNEX A.12 | Pass | -- |
| Other Parameters | | | | | | |
| 5.3.1 | 4.3.1.13 4.3.2.12 | Geo-location capability | -- | -- | -- | Note ⁶ |
| <p>Note ¹: This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.</p> <p>Note ²: This test doesn't apply for the EUT which has the RF Output power is less than 10 dBm e.i.r.p.</p> <p>Note ³: This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode.</p> <p>Note ⁴: This requirement apply to the equipment is using wide band modulations other than FHSS.</p> <p>Note ⁵: This requirement apply to the equipment is using FHSS.</p> <p>Note ⁶: The function of Geo-location capability is declared by manufacture, for a more detailed description, please refer to the user manual.</p> <p>Note ⁷: This requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode.</p> | | | | | | |

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

| | | | |
|----------------------------|-------------------------|----------------|--|
| Relative Humidity | 45% - 55% | | |
| Atmospheric Pressure | 100 kPa - 102 kPa | | |
| Temperature | NT (Normal Temperature) | +22°C to +25°C | |
| | LT (Low Temperature) | -10°C | |
| | HT (High Temperature) | +45°C | |
| Working Voltage of the EUT | NV (Normal Voltage) | 3 V | |

4.2 Test Equipment List

| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
|-----------------------------------|---------------|-------------|------------|------------|------------|
| Spectrum Analyzer | ROHDE&SCHWARZ | FSV-30 | 103118 | 2020.06.08 | 2021.06.07 |
| Spectrum Analyzer | KEYSIGHT | N9020A | MY56060183 | 2020.09.25 | 2021.09.24 |
| Vector Signal Generator | ROHDE&SCHWARZ | SMBV100A | 260592 | 2020.06.08 | 2021.06.07 |
| Signal Generator | ROHDE&SCHWARZ | SMB100A | 177746 | 2020.06.08 | 2021.06.07 |
| Switch Unit with OSP-B157 | ROHDE&SCHWARZ | OSP120 | 101270 | 2020.06.08 | 2021.06.07 |
| Bluetooth Signaling Unit | ROHDE&SCHWARZ | CMW270 | 100607 | 2020.06.08 | 2021.06.07 |
| Bluetooth Signaling Unit | ROHDE&SCHWARZ | CMW500 | 142028 | 2020.06.08 | 2021.06.07 |
| Bluetooh Signaling Unit | ROHDE&SCHWARZ | CBT | 101005 | 2020.06.08 | 2021.06.07 |
| EMI Receiver | KEYSIGHT | N9038A | MY53220118 | 2020.06.09 | 2021.06.08 |
| Test Antenna-Loop(9 kHz-30 MHz) | SCHWARZBECK | FMZB 1519 | 1519-037 | 2019.10.29 | 2021.10.28 |
| Test Antenna-Bi-Log(30 MHz-3 GHz) | SCHWARZBECK | VULB 9163 | 9163-624 | 2019.07.02 | 2021.07.01 |
| Test Antenna-Horn(1-18 GHz) | SCHWARZBECK | BBHA 9120D | 9120D-1917 | 2019.07.02 | 2021.07.01 |
| Test Antenna-Horn (18-40 GHz) | A-INFO | LB-180400KF | J211060273 | 2021.01.05 | 2023.01.04 |
| Anechoic Chamber | RAINFORD | 9m*6m*6m | N/A | 2017.02.21 | 2022.02.20 |

4.3 Test Software List

| Description | Manufacturer | Software Version | Serial No. |
|--------------|---------------|------------------|------------|
| TS8997 EMC32 | ROHDE&SCHWARZ | V10.00.00 | N/A |

4.4 Measurement Uncertainty

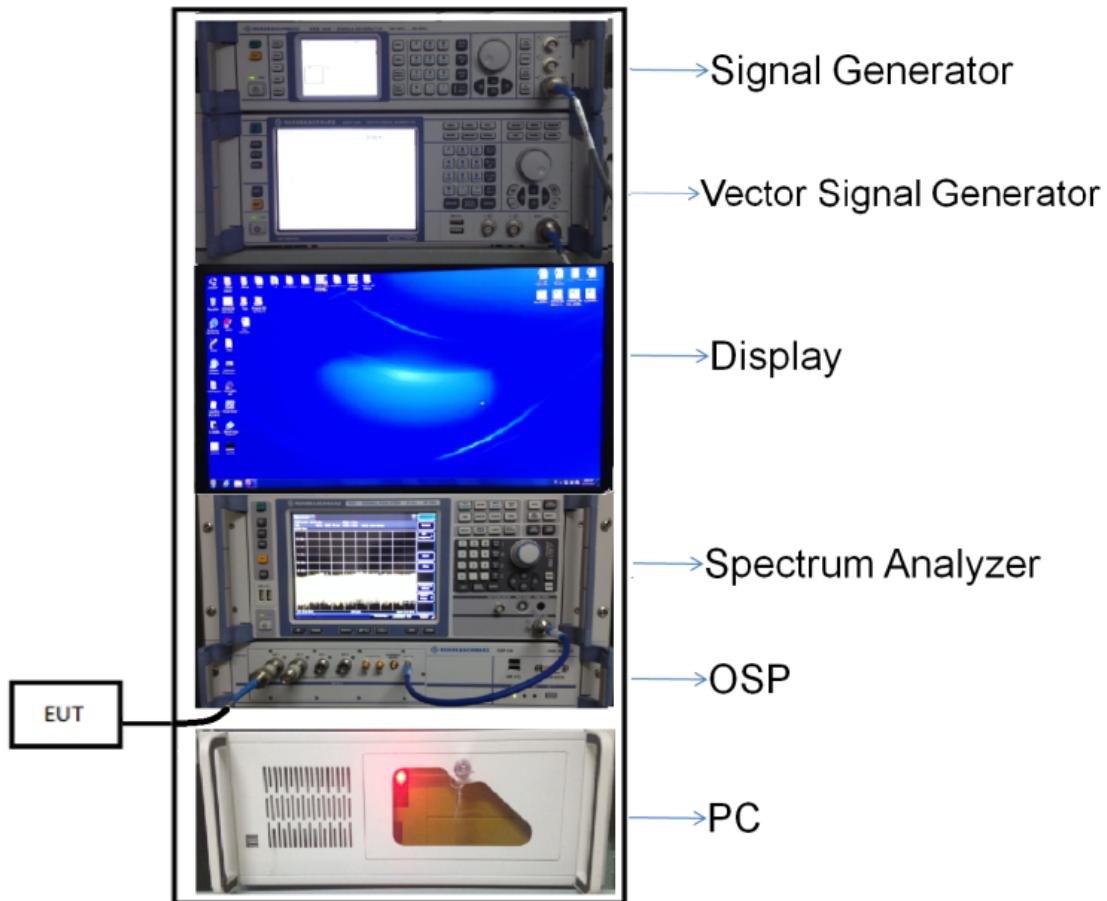
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Measurement | Value |
|-----------------------------------|----------|
| Occupied Channel Bandwidth | ±4 % |
| RF output power, conducted | ±1.21 dB |
| Power Spectral Density, conducted | ±1.25 dB |
| Unwanted Emissions, conducted | ±1.26 dB |
| All emissions, radiated | ±3.86 dB |
| Temperature | ±1 °C |
| Humidity | ±4 % |

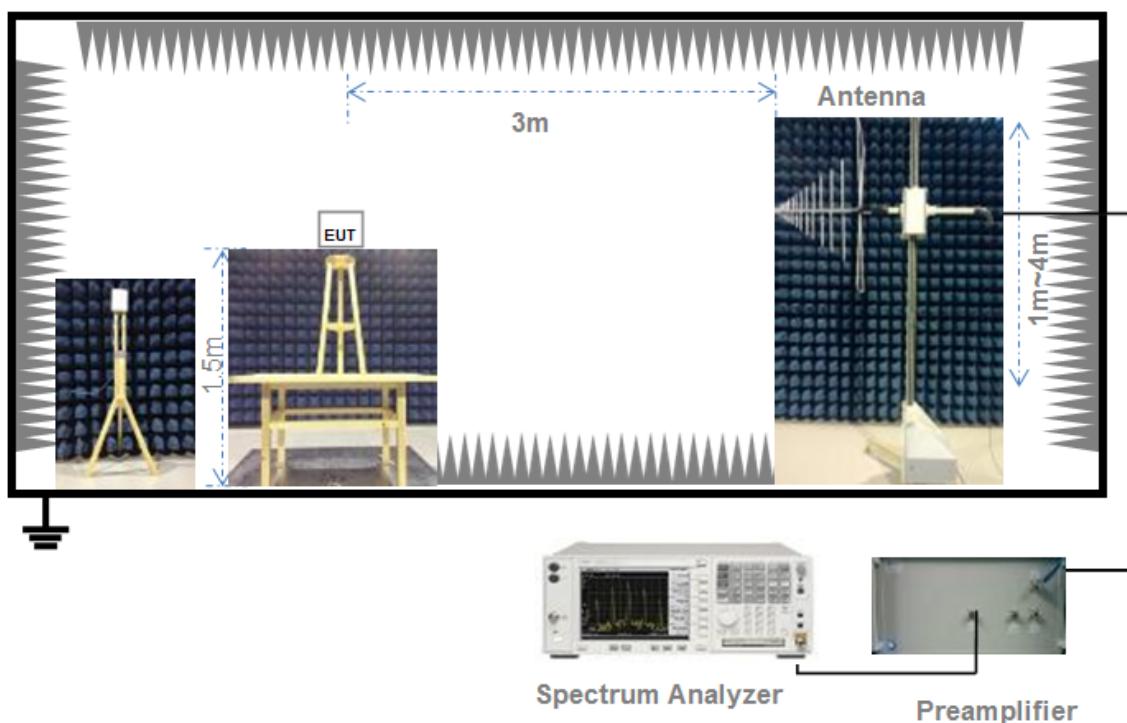
4.5 Description of Test Setup

4.5.1 For Conducted Test

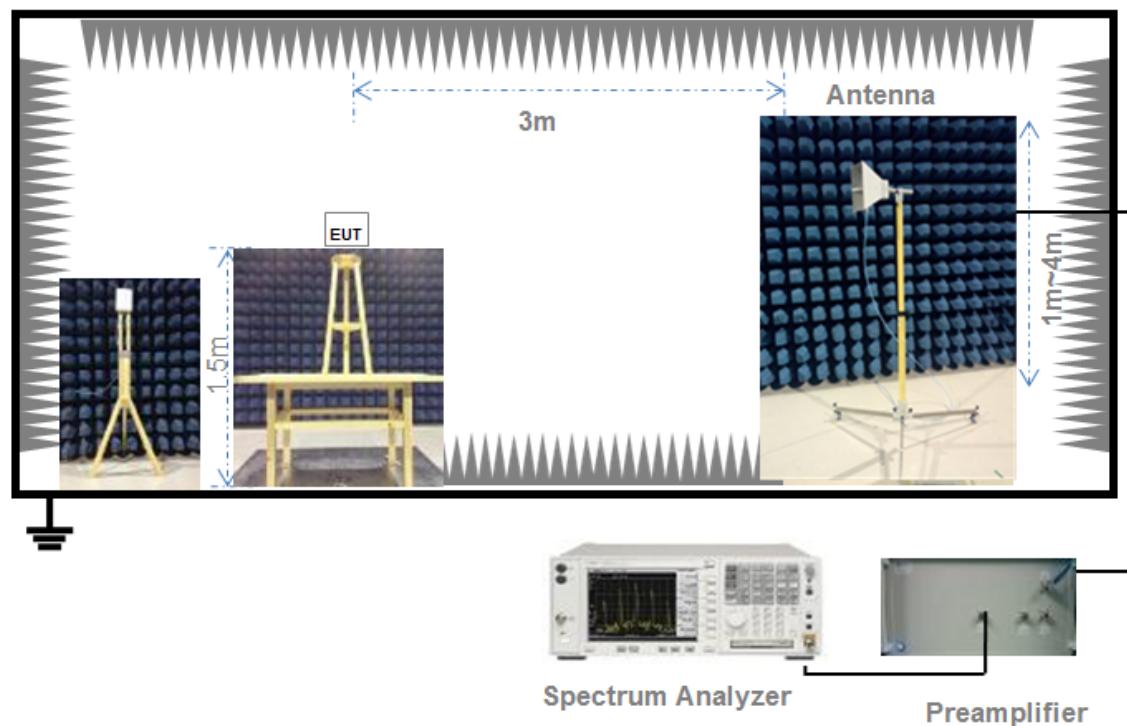


(Diagram 1)

4.5.2 For Radiated Test

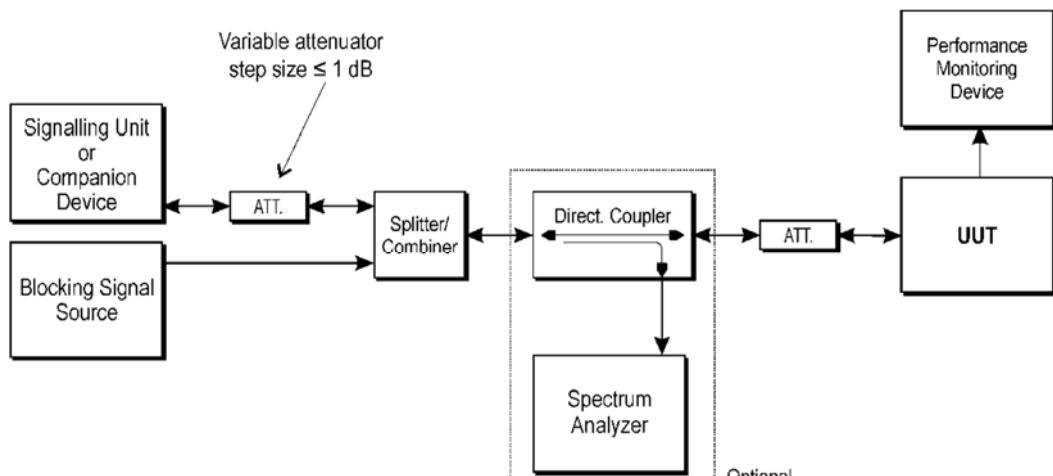


(Diagram 2)



(Diagram 3)

4.5.3 For Receiver Blocking Test



(Diagram 4)

5 Test Type and Test Results

5.1 Transmitter Parameters

5.1.1 RF output power

5.1.1.1 Limit

The maximum RF output power shall be equal to or less than 20 dBm.

5.1.1.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.2.2.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Power Spectral Density

5.1.2.1 Limit

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

5.1.2.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.3.2.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Duty Cycle, Tx-sequence, Tx-gap

5.1.3.1 Limit

For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier. In addition, the maximum Tx-sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms.

For equipment using wide band modulations other than FHSS, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier. In addition, The Tx-sequence time shall be equal to or less than 10 ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

5.1.3.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.2.2.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

5.1.4.1 Limit

The Accumulated Transmit Time on any hopping frequency shall not be greater than 15 ms within any observation period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between $((1 / U) \times 25\%)$ and 77 % where U is the number of hopping frequencies in use.

5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.4.2.

5.1.4.4 Test Result

Please refer to ANNEX A.4.

5.1.5 Hopping Frequency Separation

5.1.5.1 Limit

For adaptive frequency hopping systems, the minimum Hopping Frequency Separation shall be 100 kHz.

5.1.5.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.5.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.5.2.

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Medium Utilisation (MU) factor

5.1.6.1 Limit

For non-adaptive equipment, the maximum Medium Utilisation factor shall be 10 %.

5.1.6.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.6.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.2.2.

5.1.6.4 Test Result

Please refer to ANNEX A.6.

5.1.7 Adaptivity

5.1.7.1 Limit

Adaptive Frequency Hopping

| Requirement | Operational Mode | |
|---|---|--------------------------------|
| | Non-LBT based Detect and Avoid | LBT based Detect and Avoid |
| Minimum Clear Channel Assessment (CCA) Time | NA | 18 us (see Note ¹) |
| Maximum Channel Occupancy (COT) Time | 40 ms | 60 ms |
| Minimum Idle Period | 5% of COT | 5% of COT |
| Extended CCA check | NA | NA |
| Short Control Signalling Transmissions | Maximum duty cycle of 10 % within an observation period of 50 ms (see Note ²) | |

Note ¹: The CCA time used by the equipment shall be declared by the supplier.

Note ²: Adaptive equipment may or may not have Short Control Signaling Transmissions.

Interference threshold level:

| Maximum transmit power (P_H) EIRP dBm | Threshold level (TL) (see notes 1 and 2) |
|--|---|
| 20 | -70 dBm / MHz |
| Note ¹ : $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{\text{out}})$ (Pout in mW e.i.r.p.). | |
| Note ² : transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). | |

Unwanted Signal parameters

| Wanted signal mean power from companion device | Unwanted signal frequency (MHz) | Unwanted CW signal power (dBm) |
|---|---|--------------------------------|
| sufficient to maintain the link (see Note ²) | 2 395 or 2 488,5 (see Note ¹) | -35 (see Note ³) |
| Note ¹ : The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1. | | |
| Note ² : A typical value which can be used in most cases is -50 dBm/MHz. | | |
| Note ³ : The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain. | | |

Adaptive equipment using modulations other than FHSS

| Requirement | Operational Mode | | | |
|---|---|--------------------------------|--|---|
| | Non-LBT based Detect and Avoid | LBT based Detect and Avoid | | |
| | | Frame Based Equipment | Load Based Equipment (CCA using 'energy detect') | Load Based Equipment (CCA not using any of the mechanisms referenced as Note ²) |
| Minimum Clear Channel Assessment (CCA) Time | NA | 18 us (see Note ¹) | (see Note ²) | 18 us (see Note ¹) |
| Maximum Channel Occupancy (COT) Time | 40 ms | 1 ms to 10 ms | (see Note ²) | 13 ms |
| Minimum Idle Period | 5% of COT | 5% of COT | (see Note ²) | NA |
| Extended CCA check | NA | NA | (see Note ²) | a random duration in the range between 18 μ s and at least 160 μ s |
| Short Control Signalling Transmissions | Maximum duty cycle of 10 % within an observation period of 50 ms (see Note ³) | | | |

Note ¹: The CCA time used by the equipment shall be declared by the supplier.

Note ²: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8

Note ³: Adaptive equipment may or may not have Short Control Signaling Transmissions.

Interference threshold level:

| Maximum transmit power (P_H) EIRP dBm | Threshold level (TL) (see notes 1 and 2) |
|--|---|
| 20 | -70 dBm / MHz |
| Note 1: $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out})$ (Pout in mW e.i.r.p.). | |
| Note 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). | |

Unwanted Signal parameters

| Wanted signal mean power from companion device | Unwanted signal frequency (MHz) | Unwanted CW signal power (dBm) |
|---|----------------------------------|--------------------------------|
| sufficient to maintain the link (see note 2) | 2 395 or 2 488,5 (see note 1) | -35 (see note 3) |
| Note ¹ : The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1. | | |
| Note ² : A typical value which can be used in most cases is -50 dBm/MHz. | | |
| Note ³ : The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain. | | |

5.1.7.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.7.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.6.2.

5.1.7.4 Test Result

Please refer to ANNEX A.7.

5.1.8 Occupied Channel Bandwidth

5.1.8.1 Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400 MHz to 2483.5 MHz.

5.1.8.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.8.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.7.2.

5.1.8.4 Test Result

Please refer to ANNEX A.8.

5.1.9 Transmitter unwanted emissions in the out-of-band domain

5.1.9.1 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1.

NOTE: Within the 2400 M Hz to 2483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.

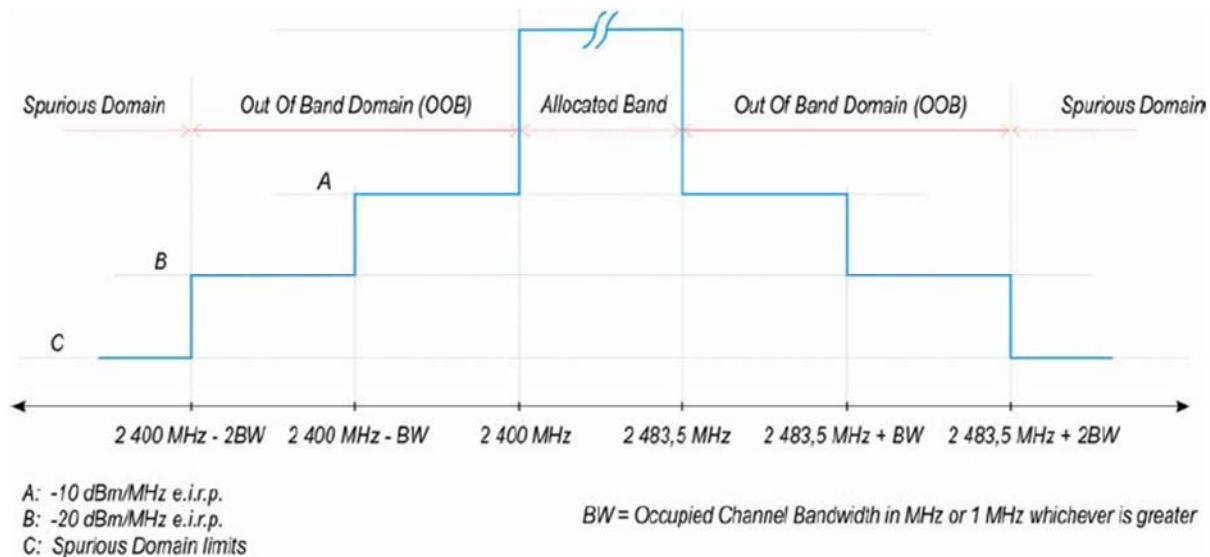


Figure 1: Transmit mask

5.1.9.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.9.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.8.2.

5.1.9.4 Test Result

Please refer to ANNEX A.9.

5.1.10 Transmitter unwanted emissions in the spurious domain

5.1.10.1 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values in following tables:

| Frequency range | Maximum power (dBm) | Bandwidth |
|---------------------|---------------------|-----------|
| 30 MHz to 47 MHz | -36 | 100 kHz |
| 47 MHz to 74 MHz | -54 | 100 kHz |
| 74 MHz to 87.5 MHz | -36 | 100 kHz |
| 87.5 MHz to 118 MHz | -54 | 100 kHz |
| 118 MHz to 174 MHz | -36 | 100 kHz |
| 174 MHz to 230 MHz | -54 | 100 kHz |
| 230 MHz to 470 MHz | -36 | 100 kHz |
| 470 MHz to 862 MHz | -54 | 100 kHz |
| 862 MHz to 1 GHz | -36 | 100 kHz |
| 1 GHz to 12.75 GHz | -30 | 1 MHz |

5.1.10.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2, 3) for test setup description. The photo of test setup please refer to ANNEX B.

5.1.10.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.9.2.

5.1.10.4 Test Result

Please refer to ANNEX A.10.

5.2 Receiver Parameters

5.2.1 Receiver categories

There have three different receiver categories for which different receiver requirements and/or corresponding limits apply.

Receiver Category

| Receiver Category | Definition |
|-------------------|--|
| Category 1 | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. |
| Category 2 | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. |
| Category 3 | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. |

5.2.2 Receiver Spurious Emissions

5.2.2.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

| Frequency range | Maximum power (dBm) | Bandwidth |
|--------------------|---------------------|-----------|
| 30 MHz to 1 GHz | -57 | 100 KHz |
| 1 GHz to 12.75 GHz | -47 | 1 MHz |

5.2.2.2 Test Setup

The section 4.5.1 (Diagram 1) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.10.2.

5.2.2.4 Test Result

Please refer to ANNEX A.11.

5.2.3 Receiver Blocking

5.2.3.1 Limit

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in next table.

Receiver Category 1 equipment

| Wanted signal mean power from companion device (dBm) | Blocking signal frequency(MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal |
|--|--------------------------------|--|-------------------------|
| Pmin + 6 dB | 2 380 | -53 | CW |
| | 2 503.5 | -53 | CW |
| Pmin + 6 dB | 2 300 | -47 | CW |
| | 2 330 | -47 | CW |
| | 2 360 | -47 | CW |
| Pmin + 6 dB | 2 523.5 | -47 | CW |
| | 2 553.5 | -47 | CW |
| | 2 583.5 | -47 | CW |
| | 2 613.5 | -47 | CW |
| | 2 643.5 | -47 | CW |
| | 2 673.5 | -47 | CW |

Note ¹: Pmin is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note ²: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Receiver Category 2 equipment

| Wanted signal mean power from companion device (dBm) | Blocking signal frequency(MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal |
|--|--------------------------------|--|-------------------------|
| Pmin + 6 dB | 2 380 | -57 | CW |
| | 2 503.5 | -57 | CW |
| Pmin + 6 dB | 2 300 | -47 | CW |
| | 2 583.5 | -47 | CW |

Note ¹: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note ²: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Receiver Category 3 equipment

| Wanted signal mean power from companion device (dBm) | Blocking signal frequency(MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal |
|--|--------------------------------|--|-------------------------|
| Pmin + 12 dB | 2 380 | -57 | CW |
| | 2 503.5 | -57 | CW |
| Pmin + 12 dB | 2 300 | -47 | CW |
| | 2 583.5 | -47 | CW |

Note ¹: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note ²: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Categorization

| Receiver category | Definition |
|-------------------|--|
| 1 | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment. |
| 2 | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment. |
| 3 | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment |

5.2.3.2 Test Setup

See the section 4.5.3 (Diagram 4) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.1.1 clause 5.4.11.2.

5.2.3.4 Test Result

Please refer to ANNEX A.12.

5.3 Other Parameters

5.3.1 Geo-location capability

5.3.1.1 Requirements

The geographical location determined by the equipment as defined in following section (5.3.1.2) shall not be accessible to the user.

5.3.1.2 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

5.3.1.3 Test Result

Please refer to section 3.

ANNEX A TEST RESULT

A.1 RF output power

Test Data

Note: EIRP Power = Conducted Power + Antenna Gain

| Modulation Mode | | O-QPSK | | |
|--|-----------------|-------------|-------------------------------|----------------|
| Limit | | 20 dBm | | |
| Test Result | | | | |
| Test Method | Test Conditions | | Transmitter Power Level (dBm) | |
| <input type="checkbox"/> Radiated <input checked="" type="checkbox"/> Conducted | Voltage | Temperature | Low Channel | Middle Channel |
| | | | EIRP | EIRP |
| | | NT | 9.4 | 9.3 |
| | | LT | 9.2 | 9.5 |
| | HT | 9.6 | 9.0 | 8.5 |
| Test Verdict | | | Pass | |

Bursts Power List

O-QPSK: Low Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm | ms | ms | ms | ms |
| 9.6 | 0.000 | 1000.000 | 1000.000 | 0.000 |

O-QPSK: Middle Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm | ms | ms | ms | ms |
| 9.5 | 0.000 | 1000.000 | 1000.000 | 0.000 |

O-QPSK: High Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm | ms | ms | ms | ms |
| 8.9 | 0.000 | 1000.000 | 1000.000 | 0.000 |

A.2 Power spectral density

Measuring Parameter

| Frequency Range | RBW (MHz) | 10 kHz |
|------------------------|---------------|----------|
| 2400 MHz to 2483.5 MHz | VBW (MHz) | 30 kHz |
| | Sweep points | 8351 |
| | Detector mode | RMS |
| | Trace mode | Max Hold |
| | Sweep time | Auto |

Test Data

Note: The Power density is ERIP Power density, which is contain antenna gain.

| Modulation Mode | | | O-QPSK | | |
|--|-----------------|---------|-------------------------|------------------------|------------------------|
| Limit | | | 10 dBm/MHz | | |
| Test Result | | | | | |
| Test Method | Test Conditions | | Power density (dBm/MHz) | | |
| | Temperature | Voltage | Low Channel | Middle Channel | High Channel |
| | | | Power Spectral density | Power Spectral density | Power Spectral density |
| <input type="checkbox"/> Radiated <input checked="" type="checkbox"/> Conducted | NT | NV | 8.0 | 7.7 | 7.1 |
| Test Verdict | | | Pass | | |

A.3 Duty Cycle, Tx-sequence, Tx-gap

Note ¹: The maximum value of Duty Cycle declared by the supplier.

Test Data

| Duty Cycle (%) | Limit Duty Cycle (%) ^{Note1} | Number of Bursts | Minimum Tx-On (ms) | Maximum Tx-On (ms) | Minimum Tx-Off (ms) | Maximum Tx-Off (ms) | Measurement Time (ms) | Comment |
|----------------|---------------------------------------|------------------|--------------------|--------------------|---------------------|---------------------|-----------------------|---------|
| -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note ²: Not applicable.

A.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Note: Not applicable.

A.5 Hopping Frequency Separation

Note: Not applicable.

A.6 Medium Utilisation (MU) factor

| Medium Utilisation (MU) (%) | Limit Medium Utilisation (MU) (%) | Verdict |
|-----------------------------|-----------------------------------|---------|
| -- | 10 | -- |

Note: Not applicable.

A.7 Adaptivity

Note: Not applicable.

A.8 Occupied Channel Bandwidth

Measuring Parameter

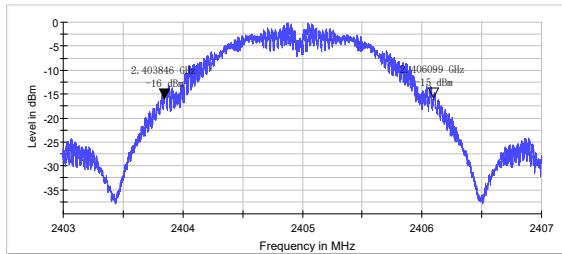
| | |
|------------------|--|
| Centre Frequency | The centre frequency of the channel under test |
| RBW (kHz) | 100 kHz |
| VBW (kHz) | 300 kHz |
| Span (MHz) | 3 MHz |
| Detector mode | RMS |
| Trace mode | Max Hold |
| Sweep time | Auto |
| Test Method | <input type="checkbox"/> Radiated <input checked="" type="checkbox"/> Conducted |

Test Data

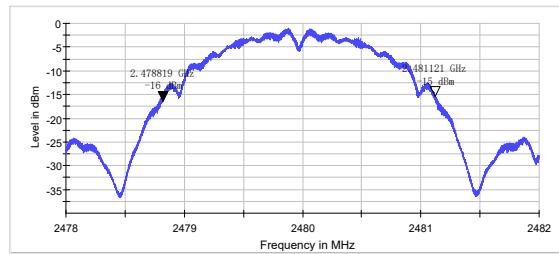
| Test Conditions | | Test Mode | DUT Frequency (MHz) | Channel Centre Frequency (MHz) | Occupied Channel Bandwidth (MHz) | Lower Band Edge (MHz) | Upper Band Edge (MHz) | Limit (MHz) |
|-----------------|---------|-----------|---------------------|--------------------------------|----------------------------------|-----------------------|-----------------------|--|
| Tempe rature | Voltage | | | | | | | |
| NT | NV | O-QPSK | 2405 | 2404.972254 | 2.253218 | 2403.845644 | 2406.098863 | Within The Band 2400 MHz to 2483.5 MHz |
| | | | 2480 | 2479.969754 | 2.302212 | 2478.818648 | 2481.120860 | |
| Test Verdict | | Pass | | | | | | |

Test Plots

O-QPSK: Low Channel



O-QPSK: High Channel



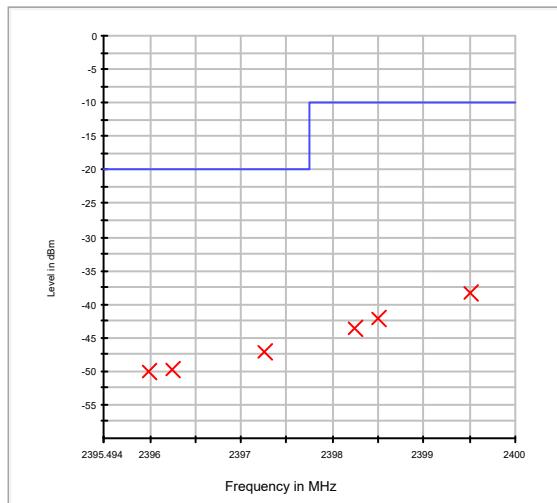
A.9 Transmitter unwanted emissions in the out-of-band domain

Test Data

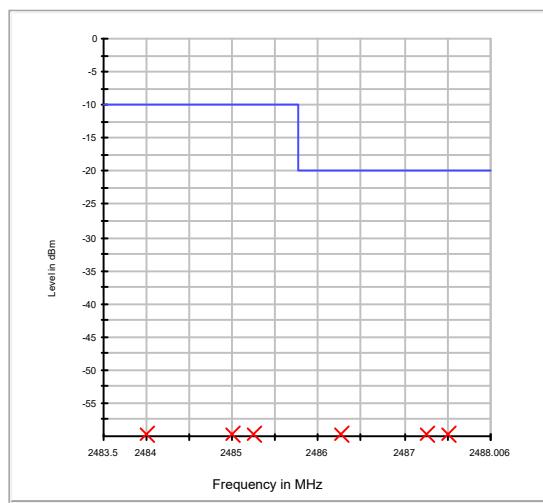
| Test Method | Test Conditions | | Test Mode | Frequency (MHz) | OOB Emission Worst level(dBm/MHz) | Limit(dBm/MHz) |
|---|-----------------|---------|-----------|-----------------|-----------------------------------|----------------|
| | Temperature | Voltage | | | | |
| <input type="checkbox"/> Radiated | NV | NT | O-QPSK | 2405 | -38.4 | -10,-20 |
| <input checked="" type="checkbox"/> Conducted | | | | 2480 | -32.0 | -10,-20 |
| Test Verdict | | | Pass | | | |

Test Plots

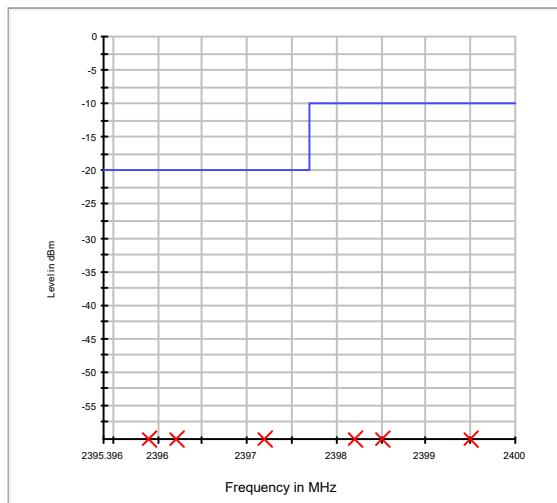
O-QPSK: Low frequency (Part 1)



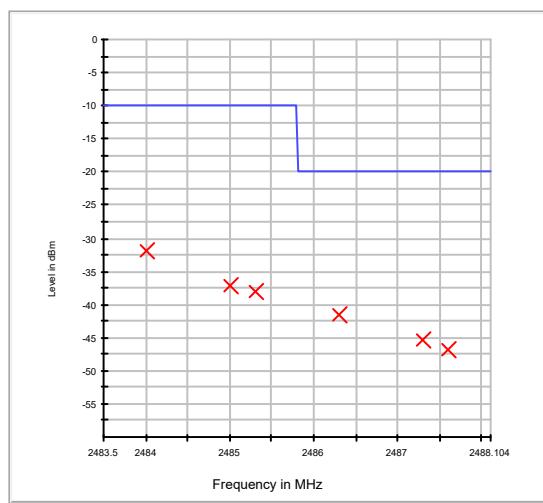
O-QPSK: Low frequency (Part 2)



O-QPSK: High frequency (Part 1)



O-QPSK: High frequency (Part 2)



A.10 Transmitter Spurious Emissions

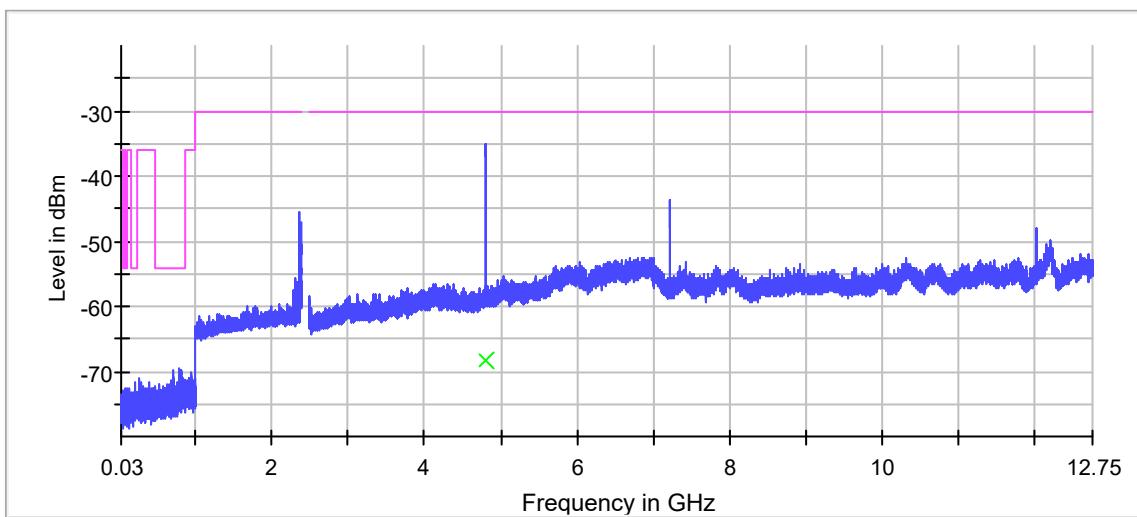
Note: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

Measuring Parameter

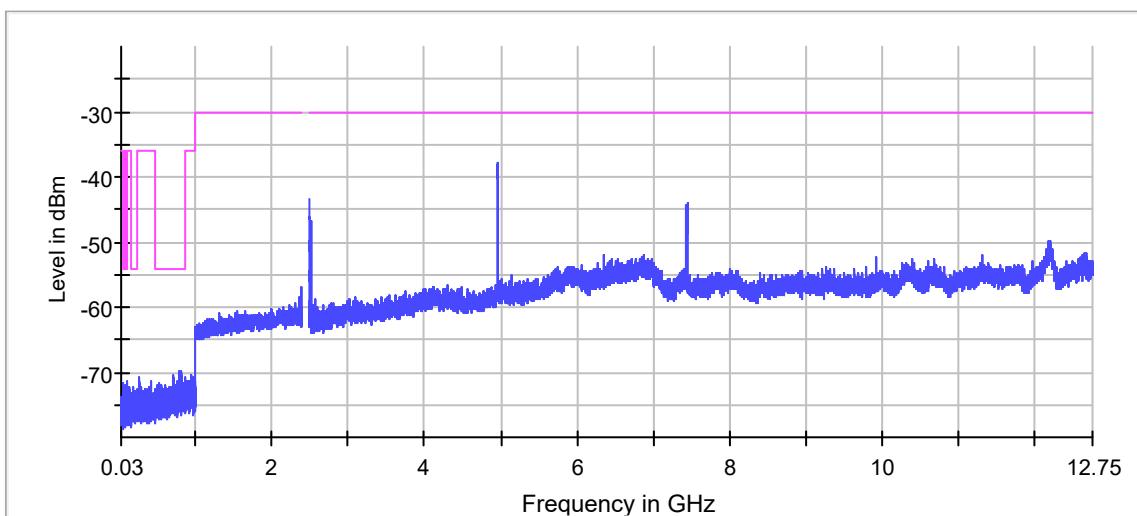
| Frequency Range | | |
|---------------------|---------------|----------|
| 30 MHz to 1 000 MHz | RBW (MHz) | 100 kHz |
| | VBW (MHz) | 300 kHz |
| | Sweep points | 19400 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |
| 1 GHz to 12,75 GHz | RBW (MHz) | 1 MHz |
| | VBW (MHz) | 3 MHz |
| | Sweep points | 23500 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |

Conducted Test Data

O-QPSK: Low Frequency



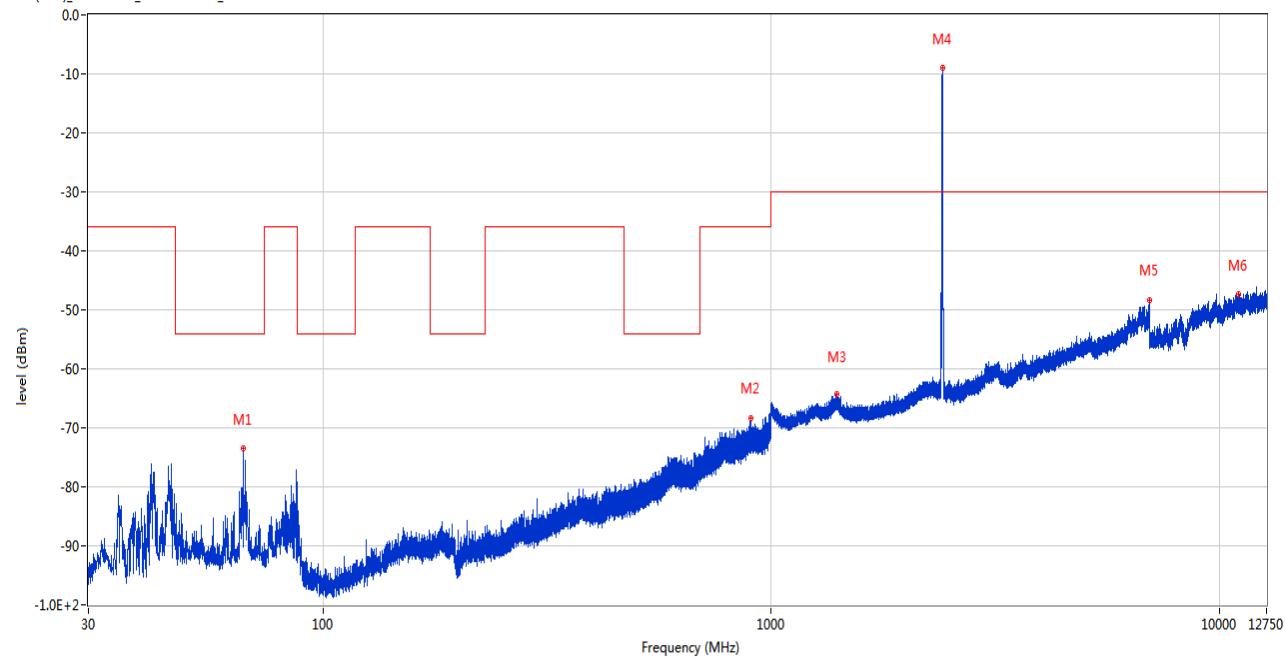
O-QPSK: High Frequency



Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT V

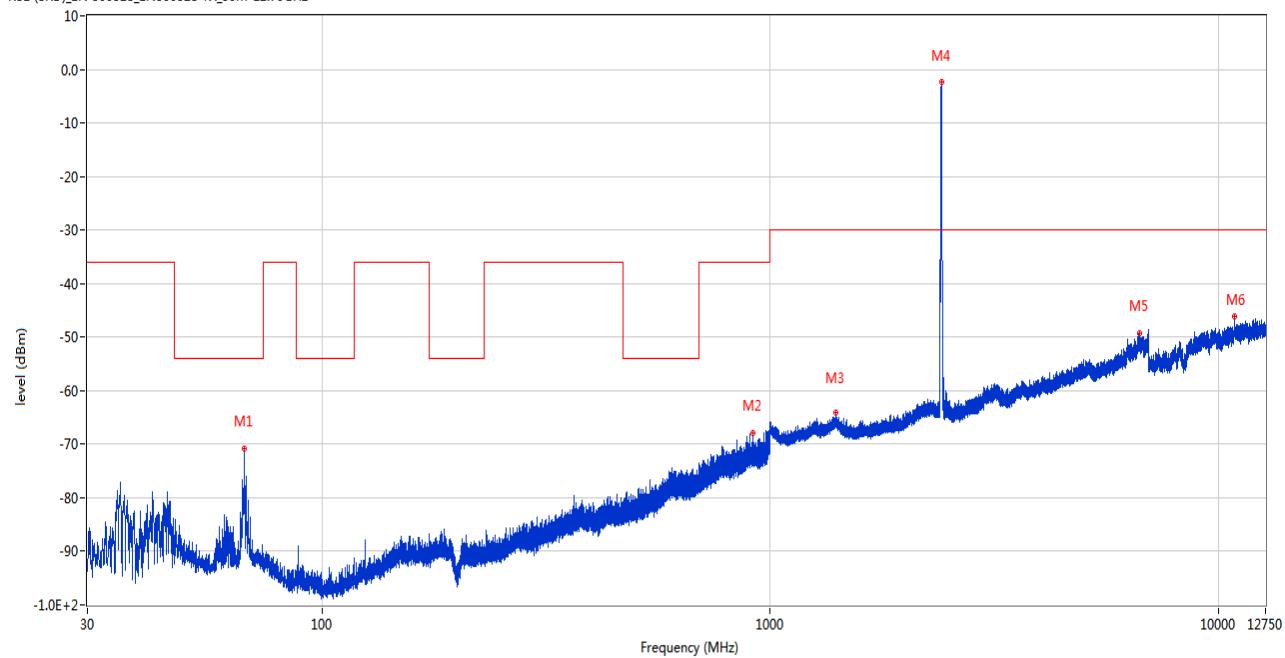
RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT | EUT | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|----------|------------|---------|
| 66.569 | -73.57 | -15.77 | -54.0 | -19.57 | 45.00 | Vertical | Horizontal | Pass |
| 900.284 | -68.37 | 3.25 | -36.0 | -32.37 | 95.00 | Vertical | Horizontal | Pass |
| 1405.600 | -64.19 | -4.28 | -30.0 | -34.19 | 333.00 | Vertical | Horizontal | Pass |
| 2413.200 | -9.05 | -1.48 | -30.0 | 20.95 | 118.00 | Vertical | Horizontal | N/A |
| 6995.000 | -48.40 | 13.57 | -30.0 | -18.40 | 29.00 | Vertical | Horizontal | Pass |
| 11039.088 | -47.38 | 16.69 | -30.0 | -17.38 | 358.00 | Vertical | Horizontal | Pass |

30 MHz to 12.75 GHz, ANT H

RSE (SRD)_EN 300328_EN300328 TX_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT | EUT | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|------------|------------|---------|
| 67.151 | -70.78 | -15.74 | -54.0 | -16.78 | 231.00 | Horizontal | Horizontal | Pass |
| 917.308 | -67.90 | 3.22 | -36.0 | -31.90 | 251.00 | Horizontal | Horizontal | Pass |
| 1405.200 | -64.01 | -4.25 | -30.0 | -34.01 | 303.00 | Horizontal | Horizontal | Pass |
| 2415.200 | -2.31 | -1.51 | -30.0 | 27.69 | 131.00 | Horizontal | Horizontal | N/A |
| 6675.800 | -49.32 | 11.71 | -30.0 | -19.32 | 34.00 | Horizontal | Horizontal | Pass |
| 10900.225 | -46.15 | 17.72 | -30.0 | -16.15 | 23.00 | Horizontal | Horizontal | Pass |

A.11 Receiver Spurious Emissions

Note ¹: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

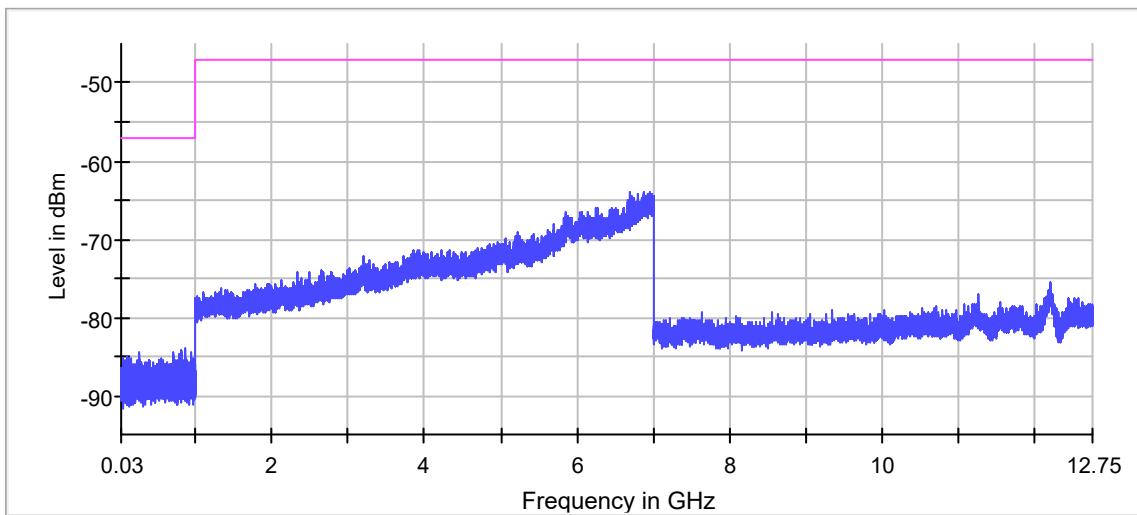
Note ²: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

Measuring Parameter

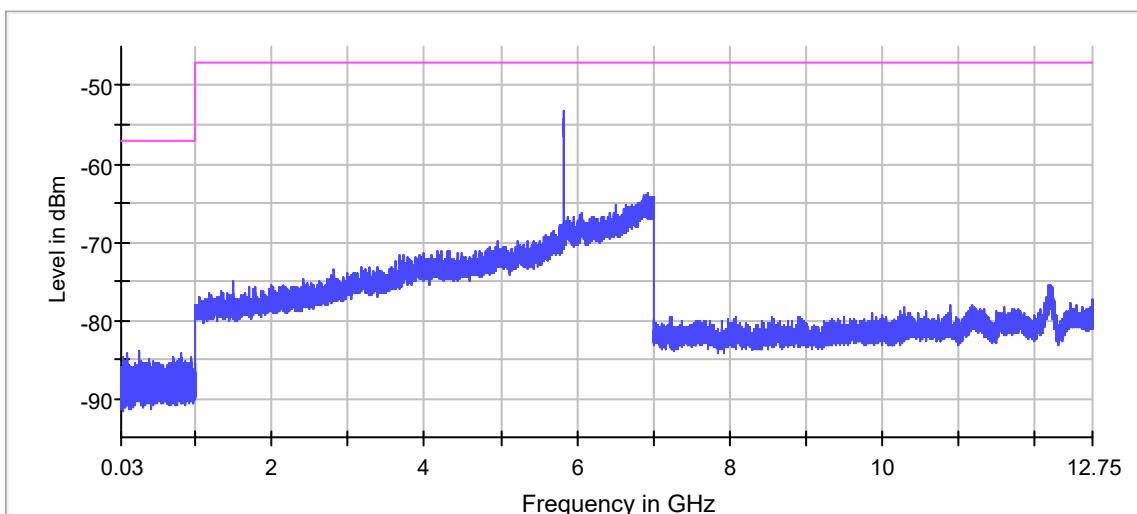
| Frequency Range | RBW (MHz) | 100 kHz |
|---------------------|---------------|----------|
| 30 MHz to 1 000 MHz | VBW (MHz) | 300 kHz |
| | Sweep points | 19400 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |
| | RBW (MHz) | 1 MHz |
| 1 GHz to 12,75 GHz | VBW (MHz) | 3 MHz |
| | Sweep points | 23500 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |

Conducted Test Data

O-QPSK: Low Frequency

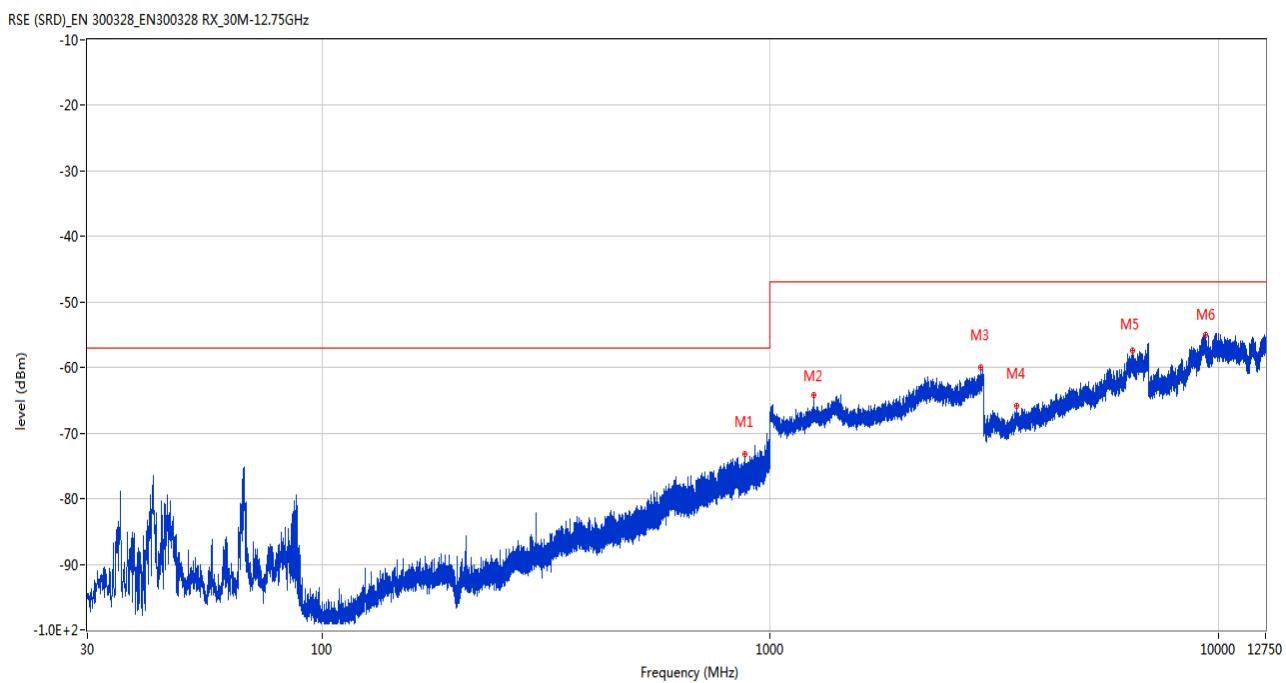


O-QPSK: High Frequency



Cabinet Radiated Test Data

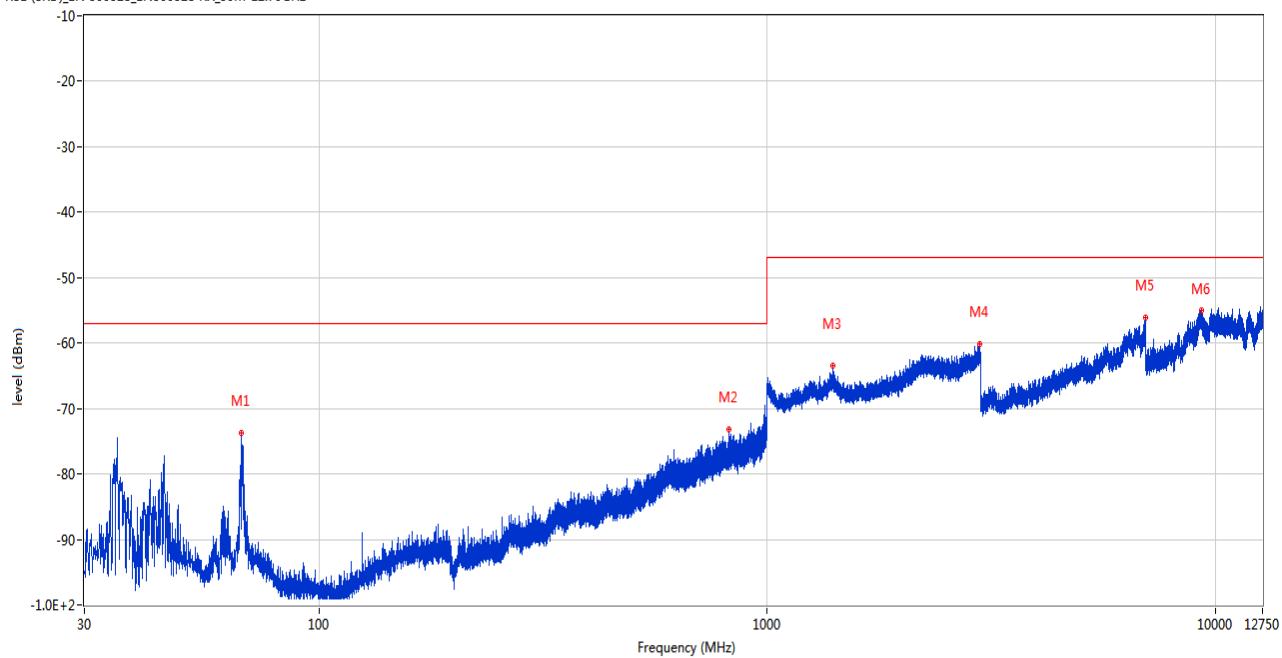
30 MHz to 12.75 GHz, ANT V



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT | EUT | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|----------|------------|---------|
| 876.907 | -73.23 | 2.22 | -57.0 | -16.23 | 33.00 | Vertical | Horizontal | Pass |
| 1250.300 | -64.18 | -5.39 | -47.0 | -17.18 | 99.00 | Vertical | Horizontal | Pass |
| 2949.600 | -59.97 | 1.11 | -47.0 | -12.97 | 361.00 | Vertical | Horizontal | Pass |
| 3549.800 | -65.75 | -4.22 | -47.0 | -18.75 | 108.00 | Vertical | Horizontal | Pass |
| 6427.800 | -57.42 | 3.86 | -47.0 | -10.42 | 149.00 | Vertical | Horizontal | Pass |
| 9367.276 | -54.98 | 8.90 | -47.0 | -7.98 | 333.00 | Vertical | Horizontal | Pass |

30 MHz to 12.75 GHz, ANT H

RSE (SRD)_EN 300328_EN300328 RX_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT | EUT | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|------------|------------|---------|
| 67.200 | -73.76 | -15.73 | -57.0 | -16.76 | -3.00 | Horizontal | Horizontal | Pass |
| 820.502 | -73.25 | 0.90 | -57.0 | -16.25 | -3.00 | Horizontal | Horizontal | Pass |
| 1401.900 | -63.48 | -4.07 | -47.0 | -16.48 | 361.00 | Horizontal | Horizontal | Pass |
| 2980.900 | -60.21 | 1.34 | -47.0 | -13.21 | 362.00 | Horizontal | Horizontal | Pass |
| 6983.200 | -56.16 | 6.21 | -47.0 | -9.16 | 1.00 | Horizontal | Horizontal | Pass |
| 9303.451 | -55.09 | 10.17 | -47.0 | -8.09 | 220.00 | Horizontal | Horizontal | Pass |

A.12 Receiver Blocking

Note: Equipment does not support a PER or a FER test to be performed. After adding interference, the device will not lose the wireless transmission function required for the intended use of the device, tests pass.

Receiver Category 2 equipment

| Wanted signal mean power from companion device (dBm) (see note) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note) | Limit | Verdict |
|--|---------------------------------|---|-------------|---------|
| (-139 dBm + 10 × log ₁₀ (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less | 2 380 | -34 | normal work | Pass |
| | 2 504 | -34 | | |
| | 2 300 | -34 | | |
| | 2 584 | -34 | | |

ANNEX B TEST SETUP PHOTOS

Please refer the document "BL-SZ2140982-AR.pdf".

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ2140982-AW.pdf".

ANNEX D EUT INTERNAL PHOTOS

Please refer the document "BL-SZ2140982-AI.pdf".

--END OF REPORT--